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Carrier Dynamics and Band Structure in InGaAs and InGaAs/InP Nanowires[1] SAMUEL LINSER, IRAJ SHOJAEI, GIRIRAJ JNAWALI, NADEEKA WICKRAMASURIYA, HOWARD JACKSON, LEIGH SMITH, Department of Physics, University of Cincinnati, Cincinati, OH, AMIRA AMERUDDIN, PHILIPPE CAROFF, HOE TAN, CHENNUPATI JAGADISH, Department of Electronic and Materials Engineering, Australian National University, Canberra, Australia — We use transient Rayleigh scattering (TRS) measurements to explore the electronic energy structure of wurtzite InGaAs nanowires. We studied single core-only InGaAs nanowires as well as strained core-shell InGaAs-InP heterostructures at 300 K and 10 K, with probe photon energies in the near-infrared from 0.79 to 1.16 eV. We report a factor of four enhancement of the typical lifetime of excited states in the core-shell nanowires (500 ps) when compared to the core-only nanowires (125 ps). We observe a clear band-edge-like structure in the core-shell wires at energies of 0.98 eV at 10 K and 0.88 eV at 300 K. In both cases, this structure is at a significantly higher energy than the reported bandgap of bulk zincblende InGaAs of the same nominal composition as our nanowires. We also present a phenomenological fitting model of our TRS spectra which provides insight into the cooling dynamics of the electron-hole plasma within a single photo-excited nanowire.

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